

- 8 a $\overrightarrow{OM} = \frac{1}{2} \overrightarrow{OA} = 3\mathbf{u} - 2\mathbf{v}$
 $\overrightarrow{AB} = (3\mathbf{u} - \mathbf{v}) - (6\mathbf{u} - 4\mathbf{v}) = 3\mathbf{v} - 3\mathbf{u}$
 $\overrightarrow{ON} = \overrightarrow{OA} + \frac{1}{3} \overrightarrow{AB} = (6\mathbf{u} - 4\mathbf{v}) + \frac{1}{3}(3\mathbf{v} - 3\mathbf{u}) = 5\mathbf{u} - 3\mathbf{v}$
- b $\overrightarrow{CM} = (3\mathbf{u} - 2\mathbf{v}) - (\mathbf{v} - 3\mathbf{u}) = 6\mathbf{u} - 3\mathbf{v}$
 $\overrightarrow{CN} = (5\mathbf{u} - 3\mathbf{v}) - (\mathbf{v} - 3\mathbf{u}) = 8\mathbf{u} - 4\mathbf{v}$
 $\therefore \overrightarrow{CN} = \frac{4}{3} \overrightarrow{CM}$
 $\therefore \overrightarrow{CN}$ and \overrightarrow{CM} are parallel
common point $C \therefore C, M$ and N are collinear
- 9 a $a = 5, b = 3$
- b $2 + b = 0$ and $a - 4 = 0$
 $\therefore a = 4, b = -2$
- c $-1 = b$ and $4a = -2$
 $\therefore a = -\frac{1}{2}, b = -1$
- d $2a + 6 = 0$ and $b - a = 0$
 $\therefore a = -3, b = -3$
- 10 a $\overrightarrow{OC} = \frac{1}{2} \mathbf{a}$
 $\overrightarrow{CB} = \mathbf{b} - \frac{1}{2} \mathbf{a}$
 $\overrightarrow{OD} = \frac{1}{2} \mathbf{a} + \frac{1}{2} (\mathbf{b} - \frac{1}{2} \mathbf{a}) = \frac{1}{4} \mathbf{a} + \frac{1}{2} \mathbf{b}$
- b $\overrightarrow{AB} = \mathbf{b} - \mathbf{a}$
 $\overrightarrow{OE} = \overrightarrow{OA} + k \overrightarrow{AB}$
 $\therefore \overrightarrow{OE} = \mathbf{a} + k(\mathbf{b} - \mathbf{a})$
- c $\overrightarrow{OE} = l \overrightarrow{OD}$
 $\therefore \mathbf{a} + k(\mathbf{b} - \mathbf{a}) = l(\frac{1}{4} \mathbf{a} + \frac{1}{2} \mathbf{b})$
 $\therefore 1 - k = \frac{1}{4} l$
and $k = \frac{1}{2} l$
adding $1 = \frac{3}{4} l$
 $l = \frac{4}{3}$
 $\therefore \overrightarrow{OE} = \frac{4}{3} (\frac{1}{4} \mathbf{a} + \frac{1}{2} \mathbf{b}) = \frac{1}{3} \mathbf{a} + \frac{2}{3} \mathbf{b}$
- d $k = \frac{1}{2} l = \frac{2}{3}$
 $\therefore \overrightarrow{AE} = \frac{2}{3} \overrightarrow{AB}$
 $\therefore AE : EB = 2 : 1$